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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/566,721

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Kazuhiro Shiomi

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EXAMINER

KRUPICKA, ADAM C

ART UNIT

PAPER NUMBER

1794

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/566,721	<b>Applicant(s)</b> SHIOMI ET AL.	
	<b>Examiner</b> Adam C. Krupicka	<b>Art Unit</b> 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/02/2006</u> .  | 6) <input type="checkbox"/> Other: ____.                          |

## DETAILED ACTION

### *Claim Objections*

The claims are objected to because they include references to figures where the examiner does not consider the present invention to be so complex that there is no practical way of describing it in words. Where possible, claims are to be complete in themselves. Incorporation by reference to a specific figure or table "is permitted only in exceptional circumstances where there is no practical way to define the invention in words and where it is more concise to incorporate by reference than duplicating a drawing or table into the claim. Incorporation by reference is a necessity doctrine, not for applicant's convenience." *Ex parte Fressola*, 27 USPQ2d 1608, 1609 (Bd. Pat. App. & Inter. 1993). See MPEP § 2173.05(s).

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1, 2, 10, 11, and 16** are rejected under 35 U.S.C. 102(b) as being anticipated by Soga *et al.* (WO 02/49797) here in referring to English language equivalent PGPub US 2006/0061974.

**Regarding applicants' claims 1 and 2**, Soga *et al.* teach a power module comprising a copper base (*considered to be a first layer composed of Cu, figure 6 #49*) and a substrate which

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may be molybdenum (*considered to be a second layer composed of Mo, paragraph 0140 and figure 6 #48*) with a Sn-0.7Cu solder layer therebetween (*considered to be a first brazing layer having at least 1% Sn, paragraph 0137 and figure 6 #47*). See also paragraph 0029. Sn-0.7Cu is considered to be 0.7% copper, with the balance composed of Sn less any impurities.

Further it is noted that the recitation in the claims that the composite structure is a heat sink is considered to be an intended use. Applicants attention is drawn to MPEP 2111.02 which states that intended use statements must be evaluated to determine whether the intended use results in a structural difference between the claimed invention and the prior art. Only if such structural difference exists, does the recitation serve to limit the claim. If the prior art structure is capable of performing the intended use, then it meets the claim.

It is the examiner's position that the intended use recited in the present claims does not result in a structural difference between the presently claimed invention and the prior art and further that the prior art structure is capable of performing the intended use. Given that Soga *et al.* disclose a power module consistent in composition with the present claims, it is clear that the structure of Soga *et al.* would be capable of performing the intended use, i.e. performing as a heat sink, as presently claimed and required in the above cited portion of the MPEP.

**Regarding applicants' claims 10 and 11**, Soga *et al.* teach a power module as shown above formed with a solder. The examiner notes this requires bonding by melting the Sn-Cu solder between the copper and molybdenum layers.

**Regarding applicants' claim 16**, Soga *et al.* teach a power module as shown above including a copper lead (*considered to be a third layer composed of mainly Cu, figure 6 #51*) which is bonded via a solder layer of Sn-0.7Cu on the side of the molybdenum layer opposite the

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copper base layer. The examiner notes that the formation of the power module requires the melting of the solder material between the copper base and molybdenum layer as well as the copper lead and the molybdenum layer.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-12, and 14-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda *et al.* (JP H11-284111 A) in view of Jin *et al.* (US Pat. 6,326,685).

**Regarding applicants' claims 1-3, 6, and 7**, Ueda *et al.* teach a heat sink member comprising a layer of molybdenum (*figure 10*) having a layer of copper disposed on both sides (*figure 10 #12 and #13*) with a layer of brazing material located between the molybdenum layer and each of the copper layers (*figure 10 #14 and #15*). *See also paragraph 10*. Ueda *et al.* do not appear to explicitly teach a brazing layer of between 1 and 13 mass % Sn. However Jin *et al.* teach a low thermal expansion composite having Sn-Cu material with a Sn content from 0-20% (*col. 4 lines 22-37*), which is considered to overlap the limitations set forth by applicant with sufficient specificity. Jin *et al.* teach that thermal mismatches often cause mechanical and electrical failures and that a mismatch often occurs in heat sink materials (*col. 1 lines 15-30*). To create a reduced coefficient of thermal expansion body for heat sinks Jin *et al.* teach the use of

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Sn-Cu composites between layers of copper. It would have been obvious for one of ordinary skill in the art at the time of the invention to use the Sn-Cu compositions of Jin *et al.* as the brazing material in the composite structure of Ueda *et al.* in order to create a reduced coefficient of thermal expansion heat sink that will reduce failure of the heat sink during the thermal cycling. Further it is noted that one of ordinary skill would recognize the Sn-Cu containing compositions, as suggested by Jin *et al.*, are consistent with known brazing and solder compositions used in the manufacture of thermal composites.

**Regarding applicants' claim 4**, although Ueda *et al.* do not disclose formation of the molybdenum layer by sintering, it is noted that “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior art product was made by a different process”, *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Further, “although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product”, *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 298, 292 (Fed Cir. 1983). See MPEP 2113.

**Regarding applicants' claims 5 and 9**, one of ordinary skill in the art at the time of the invention would have found it obvious to adjust the thickness of the copper and molybdenum layers to achieve the best heat transfer and dissipation, while minimizing the materials required. Further because both applicants' and Ueda *et al.* are forming heat sinks from similar materials it

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would be expected that the optimum thickness for the copper and molybdenum layers achieved by one of ordinary skill in the art is consistent with those taught, and claimed by applicants'.

**Regarding applicants' claim 6 and 8,** Ueda *et al.* teach the heat sink member as shown above fixed to a semiconductor (*paragraph 0008*), where the examiner considers a semiconductor fixed to a heat sink to have a region corresponding to a region on the semiconductor.

**Regarding applicants' claims 10-12 and 14-19,** Ueda *et al.* teach a heat sink member as shown above where the layers are joined by positioning the brazing material between the layers and then melting the brazing material (*figure 10 and paragraph 0031*).

**Claims 4 and 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda *et al.* in view of Jin *et al.*, further in view of Sakata *et al.* (PGPub US 2001/0008703).

Ueda *et al.* and Jin *et al.* teach the formation of a heat sink member as shown above, but do not appear to explicitly disclose the method for forming the molybdenum layer, however Sakata *et al.* teach a heat sink body constructed from a sintered compact of molybdenum (*paragraphs 0060 and 0061*). It would have been obvious for one of ordinary skill in the art at the time of the invention to form the molybdenum layer of Ueda *et al.* by sintering in order to produce a molybdenum layer that is low in porosity, high in strength and that is excellent in heat dispersion ability (*paragraph 0154*).

It is noted that should applicants' assign criticality with the sintering limitation as set forth in applicants' claim 4, hereabove has been provided an alternative rejection in view of Sakata *et al.*

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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adam C. Krupicka whose telephone number is (571)270-7086. The examiner can normally be reached on Monday - Thursday 7:30am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Adam C Krupicka/  
Examiner, Art Unit 1794

/JENNIFER MCNEIL/  
Supervisory Patent Examiner, Art Unit 1794